

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1. (currently amended) A Point-to-Point Protocol (PPP) termination device in an access network system by which a subscriber gets access to a backbone network, comprising:

a first interface to a Digital Subscriber Line Access Multiplexer (DSLAM);

a second interface to a backbone network;

a Point-to-Point Protocol (PPP) link controller for establishing and disconnecting a PPP link;

a header processor for converting between a network-layer packet and a PPP data packet including the network-layer packet; ~~and, and~~

a switch for switching a connection among the first interface, the second interface, the PPP link controller, and the header processor, depending on which one of a PPP data packet and a link control packet is inputted, wherein the link control packet is used for link establishment and disconnection; and

a segmentation and reassembly section,

wherein the header processor is arranged and adapted to determine which one of a PPP data packet and a link control packet is inputted from the first interface and, when the link

control packet has been inputted, the segmentation and reassembly section segments the link control packet into cells to be forwarded to the PPP link controller by the switch, wherein the PPP link controller performs a link establishment procedure based on the link control packet in the cells.

2. (currently amended) A Point-to-Point Protocol (PPP) termination device in an access network system by which a subscriber gets access to a backbone network, comprising:

a first interface for inputting and outputting PPP packets in Asynchronous Transfer Mode (ATM) cells from and to a corresponding Digital Subscriber Line Access Multiplexer (DSLAM);

a second interface for inputting and outputting network-layer packets in ATM cells from and to the backbone network;

a PPP link controller for establishing and disconnecting a PPP link;

a packet processor for converting between a network-layer packet and a PPP data packet including the network-layer packet and controlling cell forwarding; and

an ATM switch for switching ATM cells among the first interface, the second interface, the PPP link controller, and the packet processor, depending on which one of a PPP data packet in ATM cells and a link control packet in ATM cells is inputted, wherein the link control packet is used for link establishment and disconnection,

wherein the packet processor comprises a header processor, and a first AAL5-SAR (ATM Adaptation Layer type 5 - Segmentation And Reassembly) section,

wherein the header processor determines which one of a PPP data packet in ATM cells and a link control packet in ATM cells is inputted from the first interface through the first AAL5-SAR section and, when the PPP data packet has been inputted through the first AAL5-SAR section, generates a network-layer packet by removing a PPP header of the PPP data packet, and the first AAL5-SAR section segments the network-layer packet into ATM cells to be forwarded to the second interface by the ATM switch,  
and

wherein, when the link control packet has been inputted from the first interface through the first AAL5-SAR section, the first AAL5-SAR section segments the link control packet into ATM cells to be forwarded to the PPP link controller by the ATM switch, wherein the PPP link controller performs a link establishment procedure based on the link control packet in ATM cells.

3-4. (canceled)

5. (currently amended) The PPP termination device according to claim [[3]] 2, wherein, when receiving a network-layer packet in ATM cells from the backbone network, the packet processor performs PPP encapsulation to generate a PPP data packet from the network-layer packet and the first AAL5-SAR

section segments the PPP data packet into ATM cells to be forwarded to the first interface by the ATM switch.

6. (currently amended) The PPP termination device according to claim [[4]] 2, wherein the PPP link controller comprises:

a second AAL5-SAR section; and

a processor,

wherein, when receiving the link control packet from the first interface through the second AAL5-SAR section, the processor generates a response control packet in response to the link control packet and the second AAL5-SAR section segments the response control packet into ATM cells to be forwarded to the first interface by the ATM switch.

7. (currently amended) A Point-to-Point Protocol (PPP) termination device in an access network system by which a subscriber gets access to a backbone network, comprising:

a first interface for inputting and outputting PPP packets over SONET (Synchronous Optical NETwork) from and to a corresponding Digital Subscriber Line Access Multiplexer (DSLAM), wherein the first interface includes a first packet processor for determining which one of a PPP data packet and a link control packet is inputted, converting between a packet and ATM cells, and controlling cell forwarding;

a second interface for inputting and outputting network-layer packets over SONET from and to the backbone

network, wherein the second interface includes a second packet processor for converting between a network-layer packet and a PPP data packet including the network-layer packet, converting between [[a]] the PPP data packet and ATM cells, and controlling cell forwarding;

a PPP link controller for establishing and disconnecting a PPP link; and

an ATM switch for switching ATM cells among the first interface, the second interface, and the PPP link controller, depending on which one of a PPP data packet and a link control packet is inputted,

wherein the first packet processor comprises a first header processor, and a first AAL5-SAR (ATM Adaptation Layer type 5 - Segmentation And Reassembly) section,

wherein the first header processor determines which one of a PPP data packet and a link control packet is inputted from the first interface and, when the PPP data packet has been inputted, generates a network-layer packet by removing a PPP header of the PPP data packet, and the first AAL5-SAR section segments the network-layer packet into ATM cells to be forwarded to the second interface by the ATM switch, and

wherein, when the link control packet has been inputted from the first interface, the first AAL5-SAR section segments the link control packet into ATM cells to be forwarded to the PPP link controller by the ATM switch, wherein the PPP link

controller performs a link establishment procedure based on the link control packet.

8-9. (canceled)

10. (original) The PPP termination device according to claim 7, wherein the second packet processor comprises:

a second header processor; and

a second AAL5-SAR section,

wherein, when receiving a network-layer packet over SONET from the backbone network, the second header processor performs PPP encapsulation to generate a PPP data packet from the network-layer packet and the second AAL5-SAR section segments the PPP data packet into ATM cells to be forwarded to the first interface by the ATM switch.

11. (currently amended) The PPP termination device according to claim [[9]] 7, wherein the PPP link controller comprises:

a third AAL5-SAR section; and

a processor,

wherein, when receiving the link control packet from the first interface through the third AAL5-SAR section, the processor generates a response control packet in response to the link control packet and the third AAL5-SAR section segments the response control packet into ATM cells to be forwarded to the first interface by the ATM switch.

12. (currently amended) An access network system comprising:

a plurality of subscriber computers;

a plurality of Remote ADSL Transceiver Units (ATU-Rs) each connected to the subscriber computers;

a plurality of Digital Subscriber Line Access Multiplexers (DSLAMs), each of which accommodates a plurality of ATU-Rs;

an access gateway to a backbone network, the access gateway accommodating a plurality of DSLAMs,

wherein the access gateway comprises:

a first interface to a corresponding Digital Subscriber Line Access Multiplexer (DSLAM);

a second interface to the backbone network;

a Point-to-Point Protocol (PPP) link controller for establishing and disconnecting a PPP link with an ATU-R;

a header processor for converting between a network-layer packet and a PPP data packet including the network-layer packet; ~~and; and~~

a switch for switching a connection among the first interface, the second interface, the PPP link controller, and the header processor, depending on which one of a PPP data packet and a link control packet is inputted, wherein the link control packet is used for link establishment and disconnection; and

a segmentation and reassembly section,

wherein the header processor is arranged and adapted to determine which one of a PPP data packet and a link control packet is inputted from the first interface and, when the link control packet has been inputted, the segmentation and reassembly section segments the link control packet into cells to be forwarded to the PPP link controller by the switch, wherein the PPP link controller performs a link establishment procedure based on the link control packet in the cells.

13. (new) The PPP termination device of claim 1, wherein the header processor is further arranged and adapted so that when the PPP data packet has been inputted, the segmentation and reassembly section generates a network-layer packet by removing a PPP header from the PPP data packet and segments the network-layer packet into cells to be forwarded to the second interface by the switch.

14. (new) The PPP termination device of claim 12, wherein the header processor is further arranged and adapted so that when the PPP data packet has been inputted, the segmentation and reassembly section generates a network-layer packet by removing a PPP header from the PPP data packet and segments the network-layer packet into cells to be forwarded to the second interface by the switch.